NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE GENERAL SPECIFICATIONS

POND
(No.)
CODE 378

A. Embankment Ponds

FOUNDATION PREPARATION

The foundation area shall be cleared of trees, logs, stumps, roots, brush, boulders, sod, and rubbish. The topsoil and sod shall be stockpiled during construction and spread on the completed dam and spillways.

Foundation surfaces, including stream channels in the foundation area, shall be sloped no steeper than a ratio of 1-1/2 horizontal to 1 vertical. The foundation area shall be prepared to adequate moisture content and density, and the surface shall be thoroughly scarified, to allow for proper compaction and bonding of the first layer of fill material to the foundation.

The cutoff trench and any other required excavations shall be dug to the lines and grades shown on the drawings. If they are suitable, excavated material may be used in the permanent fill.

Stream channels shall be deepened and widened as necessary to remove all stones, gravel, sand, stumps, root, and other objectionable material and to accommodate compaction equipment.

Foundation areas shall be kept free of standing water when fill is placed on them.

FILL PLACEMENT

The material placed in the fill shall be free of detrimental amounts of sod, roots, frozen soil, stones more than 6 inches in diameter (except for rock fills), and other objectionable material.

Drain fill shall be kept from being contaminated by adjacent soil material during placement by either placing it in a cleanly excavated trench or by keeping the drain fill at least 1 foot above the adjacent earth fill.

Selected drain fill and backfill material shall be placed around structures, pipe conduits and risers, and anti-seep collars at about the same rate on all sides to prevent damage from unequal loading.

If openings or sectionalized fills are required, the slope of the bonding surfaces between the embankment in place and the embankment to be placed shall not be steeper than a ratio of 3 horizontal to 1 vertical. The bonding surface shall be treated the same as that specified for the foundation to ensure a good bond with the new fill.

The distribution and gradation of materials shall be such that no lenses, pockets, streaks, or layers of material shall differ substantially in texture or gradation from the surrounding material. If it is necessary to use materials of varying texture and gradation, the more impervious material shall be placed in the center and upstream parts of the fill. If zoned fills of substantially differing materials are specified, the zones shall be placed according to lines and grades shown on the drawings. The complete work shall conform to the lines, grades, and elevations shown on the drawings.

Fill material shall be obtained from selected borrow areas meeting the approval of the designated technician. Unless otherwise designated, it shall be obtained within the permanent pool area of the structure in such a manner that it will increase the effective depth of the pond as much as practical.

Moisture Control. The moisture content of the fill material shall be adequate for obtaining the required compaction. Material that is too wet shall be dried to meet this requirement, and material that is too dry shall be wetted and mixed until the requirement is met. To the greatest extent possible, mechanically

compacted soils (hand or power tamped) shall have equivalent moisture content as that of adjoining soils placed by equipment.

As a minimum, the fill material shall contain enough moisture to be able to form a ball when squeezed in the hand that will not separate when tapped with a pencil. Dry foundation materials shall have moisture added to the top six inches to meet that required for fill material prior to placement of the first layer of fill.

Compaction. Construction equipment shall be operated over each layer of fill to insure that the required compaction is obtained. Special equipment shall be used if needed to obtain the required compaction.

Foundation areas shall be dewatered and kept free of standing water prior to fill placement. Fill material shall be placed and spread beginning at the lowest point of the foundation and then bringing it up in 10 inch uniform layers properly compacted, with the equipment routed to give the best compaction practical. Where dozer equipment is used, the fill material shall be compacted by running the equipment lengthwise of the dam at intervals. This should be done (in addition to ordinary equipment routing over the 10 inch lifts) at least once for each 20 to 30 inch lift. Other methods that will give equivalent compaction will be satisfactory. Both faces of the dam must be shaped, compacted, and smooth.

If a minimum required density is specified, each layer of fill shall be compacted as necessary to obtain that density.

Fill located adjacent to structures, pipe conduits and risers, and anti-seep collars and areas adjacent to drain fill shall be compacted to a density equivalent to that of the surrounding fill by means of hand tamping or by using manually directed power tampers or plate vibrators. Fill adjacent to concrete structures shall not be compacted until the concrete has had time to gain enough strength to support the load, a minimum of 24 hours. Compacted fill placed around a riser is to extend outward from the riser the distance of the riser inlet slab and shall be compacted to the subgrade of the slab.

Vegetation. A protective cover of vegetation shall be established on all exposed areas of embankments, spillways, spoil areas, and borrow areas, according to the guidelines in Conservation Practice Standard 342, Critical Area Planting. Vegetation must be in accordance with the recommendations documented in OK-CPA-4 for the given field location and conservation plan, or according to specifications developed for the project.

Seepage Control. If rocky areas or other pervious materials are uncovered in the bottom of the pond, consider filling with a minimum 12-inches of good clay material to increase water holding capacity.

PRINCIPAL SPILLWAY

Standard Oklahoma NRCS drawings shall be used or alternate drawings can be submitted for Oklahoma NRCS engineering approval.

Installation. The principal spillway shall be installed to the alignment, elevations, grades, and dimensions shown on the plans in the following manner:

1. The entire length of the pipe shall be bedded on: (i) a minimum of two feet of compacted material; (ii) firm earthen material at least two feet below the natural ground surface; or (iii) a combination of (i) and (ii). .
2. Material located within 6 inches of the pipe (including rocks, clods, or foreign materials) shall be less than 1 inch in diameter.
3. If the bed surface will not readily conform to the shape of the pipe or contains slick or impervious areas, it shall be broken up to a minimum depth of 3 inches and a minimum width of two pipe diameters.
4. Materials located within the upper 3 inches of pipe foundation and within 3 inches of the pipe shall be wet enough to effectively compact and fill all voids adjacent to the pipe. Water will be added as needed to ensure adequate compaction. The moisture content of the backfill material outside the 3-inch limit shall be the same as for the other fill material unless otherwise specified on the plans or drawings.

5. Water packing is an option for materials having a predominance of sand (classifying as SM or SC) if the following procedures are utilized:
   a. Water packing may proceed in distances not to exceed 10 feet in length.
   b. Earthen dikes not exceeding 3 feet in width will be constructed on both sides of the pipe to the same height.
   c. Water shall be added to the area upstream of the dike, and soil shall be added until the water is displaced by soil.
   d. The entire length of the pipe will be water packed to at least the spring line, the centerline of the principal spillway pipe.
6. Water packing or hand or mechanical tamping will be required to extend 2.0 feet above the pipe before placing or compacting fill over the pipe with earth moving equipment.
7. The selected backfill material shall be placed around structures, pipe conduits, and anti-seep collars at about the same rate on all sides to prevent damage from unequal loading.
8. After seating the pipe into its bedding, subsequent backfill up to the spring line shall be placed in 4-inch layers. Each layer of material shall be thoroughly rodded or tamped around the pipe and into each corrugations by hand using a tamping bar. Hand operated power tampers will be permitted outside the 3-inch limit below the spring line and within the 3-inch limit above the spring line provided the tamper is operated in a vertical position.

Tractors, scrapers, or other heavy equipment shall not be operated within 2 feet of the sides or over the top of the pipe barrel or riser. Compaction within this 2 feet range shall be accomplished as stated above with placement in 4-inch layers until 2 feet above the pipe.

When a filter and drainage diaphragm is used for control of internal erosion, the dimensioning and location shall be in accordance with standard drawing OK-DWG-215 or by special design approved by the NRCS State Conservation Engineer.

Anti-seep collars shall be of materials compatible with that of the pipe and shall be installed so that they are watertight.

The pipe shall be installed according to the manufacturer's instruction. It shall be firmly and uniformly bedded throughout its length and shall be installed to the line and grade shown on the drawings.

Materials. All pipe materials shall conform to appropriate ASTM specifications.

Metal Components. Metal conduits shall be either welded steel, corrugated steel (CMP), corrugated aluminum, cast iron, or ductile iron.

Corrugated steel pipe and corrugated aluminum pipe shall be new material. When CMP pipe is used for barrels and risers, all welded seams shall be wire brushed and painted with two coats of zinc dust-zinc oxide primer or equivalent material.

Unless otherwise specified, CMP riser and barrel shall be helically corrugated and all connectors shall be flanged couplers, Hugger type or equivalent couplers, or annular corrugated band couplers. When the Hugger type or annular corrugated band couplers are to be used, the pipe ends shall be reformed with annular corrugations. Hugger type couplers shall be installed with o-ring gasket seals, and 18-inch and larger diameter pipe shall have one encircling rod on each side of the joint. Annular corrugated band couplers shall be 12-inch wide bands installed with o-ring or neoprene gasket seal and two encircling rods on each side of the joints. O-ring gaskets for Hugger type couplers shall be 13/16-inch diameter for less than 42-inch diameter pipe and 7/8-inch diameter for 42-inch and larger pipe. O-ring gaskets for annular corrugated couplers shall be 3/8-inch diameter and shall be fabricated from a high-grade rubber compound. They shall be homogeneous, free of blisters, pitting or other imperfections. Neoprene gaskets for annular corrugated couplers shall have a minimum width of 6 inches and a minimum thickness of 3/8 inch.

A CMP or aluminum riser, when used, shall be factory fabricated to the specifications on the plans including the barrel inlet and stub.

Aluminized or polymer coatings may be specified in certain circumstances for added protection of the steel structures. If specified, aluminized pipe shall be Aluminum-Coated Type 2 and meet ASTM A-819. Polymer coatings shall be a minimum of 0.01 inches thick (10 mil) and meet ASTM A-762.

Welded steel may be used material so long as it is sound pipe without damaging corrosion pits, does not exceed 36-inch diameter, and has wall thickness equal to or greater than the specified minimum in the standard.

Plastic Components. PVC (Polyvinylchloride) pipes may be used as conduits provided they meet the fill heights and material requirements of this standard. PVC pipes exposed to sunlight shall be painted to prevent deterioration.

Concrete. All concrete is to consist of a workable mix that can be placed and finished in an acceptable manner. The mix design and testing of concrete shall be consistent with the size and requirements for the job. Concrete shall be placed to the lines and grades as shown on the plans or as staked in the field.

The type of cement, air entrainment, slump, aggregate, or other properties shall be specified as necessary. Unless otherwise specified, the concrete mix shall produce a strength of not less than 3,000 psi in 28 days.

The concrete shall be delivered to the site and discharged into the forms within 1-1/2 hours after the introduction of the cement to the aggregates, unless a mix design with set retarder is approved for use by the technician. If needed, reinforcing steel shall be placed as indicated on the plans and shall be held securely in place during concrete placement.

Subgrades and forms shall be installed to line and grade, and the forms shall be mortar tight and unyielding as the concrete is placed. The concrete shall be consolidated in the forms as it is placed to insure a tight bond to reinforcing steel and to yield a dense concrete. Concrete shall not be placed when the outside temperature is below 40 degrees or above 90 degrees Fahrenheit.

Concrete placed during cold weather shall be protected from freezing during the curing period. The concrete shall be cured by covering it with burlap, canvas, or other suitable material and kept from drying out for at least 7 days. The concrete may be cured by coating the surface with an approved white-pigmented curing compound.

FOUNDATION AND EMBANKMENT DRAINS

Foundation and embankment drains, if required, shall be placed to the line and grade shown on the drawings. Detailed requirements for drain material and any required pipe shall be shown in the drawings and specification for the job.
Drain fill material shall be placed in uniform layers not more than 12 inches deep prior to compaction. Compaction shall be accomplished by saturating each layer immediately prior to placement of the subsequent layer.

POLLUTION CONTROL AND PROJECT COMPLETION

Construction operations shall be carried out so that erosion and air and water pollution are minimal. All work shall be conducted in a skillful and workmanlike manner. The completed job shall present a workmanlike appearance.

Measures and construction methods that enhance fish and wildlife values shall be incorporated as needed and practical. Fencing and cover to control erosion and pollution shall be established as needed. Appropriate safety measures, such as warning signs, rescue facilities, and fencing, shall be provided as needed.

B. Excavated Ponds

All applicable sections for embankment ponds will apply, including that for clearing and grubbing, foundation preparation, excavation, and pollution control and project completion.

The completed excavation shall conform to the line, grades, and elevations shown on the drawings and staked in the field. All work shall be completed in a skillful and workmanlike manner. The completed job shall present a workmanlike appearance.

The excavated earth shall be disposed of in the locations specified on the plans and spread or shaped to a uniform top and side slopes so it can be disked or mowed with regular farm equipment.

C. Computation of Earth Fill and/or Excavation Quantities

Quantities of earth fill and/or excavation shall be computed by approved methods. The earth fill and/or excavation extent will be the sum of the fill and excavation components as defined below:

Fill. The volume of material required for construction of the embankment and auxiliary spillway outside dike to the designed settled elevation and dimensions.

- The volume is to be calculated from natural ground before foundation stripping.
- If there are vertical banks to be sloped or a principal spillway foundation needs to be excavated, then the fill amount will be calculated as if these items have already been completed.
- The volume required to backfill the core trench is only included when excavated material cannot be placed in the embankment as it is being excavated. (This means the material must be either stockpiled for later use or is not suitable for fill and must be wasted.)
- The auxiliary spillway inside berm is subsidiary to the embankment construction and is not included as part of the fill calculations.

Excavation. The volume of material required for excavation to designed neat lines and grades.

- The volume of material required to be excavated to construct the designed centerline dam core trench below natural ground, before foundation stripping (after vertical banks are sloped).
- Volume of material required to excavate the pipe foundation to design grades including designed exit channel.
- Any excavation required to construct an auxiliary spillway is typically used as embankment fill, and will not normally be included in calculations. However; if the required auxiliary spillway excavation is greater than the earth fill quantity, excavation could be the controlling pay item. If the auxiliary spillway excavation volume exceeds embankment fill quantity, consult the NRCS resource engineer for guidance prior to the structure being staked for construction.
- Volume of material required to be excavated to construct a designed reservoir, or volume of earth fill, whichever is greater. When a structure involves a designed excavated pit and a designed embankment the excavated pit volume will be the extent. Exception – fill will be the extent when the volume of fill for the designed embankment is greater than the excavated pit volume.

D. Construction Tolerances

Checkout Elevations	Lower Limit (feet)	Upper Limit (feet)
Top of Dam	- 0.1[1]	N.A.[2]
Auxiliary Spillway	- 0.1[3]	+ 0.1
Principal Spillway crest and conduit invert	- 0.2	+ 0.1[3]
Principal Spillway Outlet	- 2.0	+ 0.5

[1] Provided the difference in elevation between the Top of Dam and Aux. Spillway meet the minimum design criteria.

[2] Subject to slope and pipe length criteria

[3] Provided design dimension from principal spillway inlet to auxiliary spillway is met and also that required detention storage is met

All other elevations that deviate more than 0.1 foot from design elevations must be evaluated for design adequacy.

A pond embankment will be acceptable with respect to side slopes when conditions a) and b) or a) and c) are met upon completion of construction.

a).

Planned Side Slope	Planned Unsettled Slopes		Steepest Acceptable Side Slopes
	With 5% Settlement	With 10% Settlement	
2:1	1.91:1	1.82:1	1.5:1
2.5:1	2.38:1	2.27:1	2.0:1
3:1	2.86:1	2.73:1	2.5:1
4:1	3.81:1	3.64:1	3.5:1

b). The planned cross section with allowance for settlement can be superimposed upon and within the plotted cross section of the completed dam, or

c). Exception to b): The cross section will be accepted if it meets a) above, and the sum of the front and back slopes is equal to or greater than the sum of the planned unsettled slopes. (For example, a dam with 2:1 and 3:1 planned slopes and a 10 percent settlement would have a sum of 4.55:1.)

The completed spillway excavation shall conform to the lines, grades, bottom width, and side slopes shown on the plans as nearly as skillful operation of excavating equipment will permit.

Excavated Ponds. The average bottom rod reading in the pond shall not be less than the design bottom grade rod minus 0.1 feet with no individual shot varying more than 0.5 feet.

Any section of the cut slope may vary from the design slope -0.5:1 provided the top and bottom dimensions meet or exceed those designed.